

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| | | |
|---|--|---|
| Applicant's or agent's file reference P019369WO CMG | FOR FURTHER ACTION | |
| International application No. PCT/GB2004/004806 | International filing date (day/month/year) 16/11/2004 | (Earliest) Priority Date (day/month/year) 24/11/2003 |
| see Form PCT/ISA/220 as well as, where applicable, item 5 below. | | |
| Applicant UNIVERSITY OF SOUTHAMPTON | | |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 6 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. **Certain claims were found unsearchable** (See Box II).

3. **Unity of invention is lacking** (see Box III).

4. With regard to the **title**,

the text is approved as submitted by the applicant.

the text has been established by this Authority to read as follows:

FABRICATION OF OPTICAL WAVEGUIDES IN PERIODICALLY POLED LITHIUM NIOBATE

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.

the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 2

as suggested by the applicant.

as selected by this Authority, because the applicant failed to suggest a figure.

as selected by this Authority, because this figure better characterizes the invention.

b. none of the figures is to be published with the abstract.

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Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

A method of fabricating an optical waveguide (18) comprises providing a sample of lithium niobate (10) that has one or more periodically poled gratings made by electric field poling, applying a patterned surface layer of metallic zinc (16) to a z-face of the sample so that the layer (16) has a pattern corresponding to an intended pattern of waveguides (18) to be written into the lithium niobate, and heating the sample to diffuse the metallic zinc (16) into the lithium niobate so as to form an optical waveguiding structure (18) within the sample.

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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G02F1/355 G02B6/134

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G02F G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|----------|--|-----------------------|
| X | DOMENECH M, DI PAOLO R E, LIFANTE G, CUSSO F: "Blue light by SHG in diode pumped LiNbO ₃ waveguides" PHYSICA STATUS SOLIDI A, vol. 192, no. 1, 15 March 2002 (2002-03-15), pages 135-138, XP002318439 * abstract; sections "Introduction", "Experimental Procedure" * | 1-7 -/- |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search

21 February 2005

Date of mailing of the international search report

03/03/2005

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|----------|--|-----------------------|
| Y | CANTELAR E, DI PAOLO R E, SANZ-GARCIA J A, PERNAS P L, NEVADO R, LIFANTE G, CUSSO F: "Second-harmonic generation in Zn-diffused periodically poled LiNbO ₃ channel waveguides" APPLIED PHYSICS B, vol. 73, 30 October 2001 (2001-10-30), pages 515-517, XP002318440 * sections "1. Introduction", "2. Experimental procedure", "3. Results and discussion" * | 1-7 |
| Y | BARRY I E ET AL: "Microstructuring of lithium niobate using differential etch-rate between inverted and non-inverted ferroelectric domains" MATERIALS LETTERS, NORTH HOLLAND PUBLISHING COMPANY, AMSTERDAM, NL, vol. 37, no. 4-5, November 1998 (1998-11), pages 246-254, XP004256024 ISSN: 0167-577X * section "2. Materials and methods" * | 1-7 |
| Y | TWU R-C ET AL: "ZN INDIFFUSION WAVEGUIDE POLARIZER ON A Y -CUT LINBO ₃ AT 1.32-MUM WAVELENGTH" IEEE PHOTONICS TECHNOLOGY LETTERS, IEEE INC. NEW YORK, US, vol. 12, no. 2, February 2000 (2000-02), pages 161-163, XP000912637 ISSN: 1041-1135 * section "II. Experiments" * | 1-7 |
| Y | SHIGEMATSU Y ET AL: "FABRICATION OF LINBO ₃ TE/TM WAVEGUIDES FOR 1.5 MUM WAVELENGTH BAND BY ZN/NI DIFFUSION IN LOW-PRESSURE ATMOSPHERE" JAPANESE JOURNAL OF APPLIED PHYSICS, PUBLICATION OFFICE JAPANESE JOURNAL OF APPLIED PHYSICS. TOKYO, JP, vol. 41, no. 7B, PART 1, July 2002 (2002-07), pages 4825-4827, XP001163083 ISSN: 0021-4922 * sections "1. Introduction", "2. Fabrication", figures 1-3, table 1 * | 1-7 |

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|----------|---|-----------------------|
| Y | <p>SUHARA T ET AL: "FABRICATION OF ZN:LiNbO₃ WAVEGUIDES BY DIFFUSING ZNO IN LOW-PRESSURE ATMOSPHERE"</p> <p>JAPANESE JOURNAL OF APPLIED PHYSICS, PUBLICATION OFFICE JAPANESE JOURNAL OF APPLIED PHYSICS. TOKYO, JP, vol. 39, no. 8B, PART 2, 15 August 2000 (2000-08-15), pages L864-L865, XP000977869</p> | 6,7 |
| Y | <p>ISSN: 0021-4922 * Introduction *</p> <p>YANG C ET AL: "Studies of photorefractive crystals of double-doped Ce,Fe:LiNbO₃"</p> <p>OPTICS COMMUNICATIONS, NORTH-HOLLAND PUBLISHING CO. AMSTERDAM, NL, vol. 175, no. 1-3, February 2000 (2000-02), pages 247-252, XP004189588</p> <p>ISSN: 0030-4018 abstract</p> | 6,7 |